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toothwear in children and adolescents aetiology and management

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Abstract

The increasingly common problem of toothwear in the young includes erosion, attrition and abrasion lesions. Complex in origin, the influence of diet, consumption of drinks, eating disorders, oral habits, bruxism, medical conditions and medications on toothwear will be discussed. The management of the problem is highlighted with emphasis placed on the preservation of tooth structure. Advice for the general practitioner to offer young patients is included.

Introduction

Carious damage to teeth is the most common presenting condition to the dental practitioner, but non-carious damage is becoming more common especially in the young[1]. The onset of wear of the surface of the teeth is a natural consequence of aging, and usually does not need treatment unless it is severe[2]. When teeth first erupt, the enamel surface is uneven with 'mammelon' surface characteristics, but within a relatively short period of time, these irregularities are lost by minor tooth wear.

Various conditions can render toothwear pathological, especially in the young dentition. Toothwear is usually a multi-factorial process, encompassing erosion (non-bacterial acid dissolution), attrition (direct tooth to tooth rubbing) and abrasion (physical wear by objects or substances other then another tooth)[2, 3, 4]. This paper will discuss the different types of toothwear encountered in children and adolescents, and will provide recommendations for the general practitioner to offer to young patients.

Erosion

Currently the most common mode of wear, erosion is characterised intra-orally by broad concavities within smooth surface enamel, with 'cuppings' or grooves of occlusal tooth surfaces and incisal edges, displaying exposed dentine. Worn surfaces are not usually in contact during closed eccentric movements. 'Proud' amalgam restorations are often present with surfaces appearing clean and untarnished. [1, 2, 3,]

Erosion in children

The only report on prevalence of erosion in children refers to a random sample of 14-year-olds in Liverpool[4] which found that "all children had some form of toothwear and dentine was exposed in 30% of cases". Prevalence of unacceptable wear in the normal population has not been established and no figures are available regarding the prevalence of toothwear in young children. This means that it is impossible to assess to what extent teeth wear, and in particular erosion, is a problem[5].

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president's report

Bon Anee - welcome to the New Year. After being lucky enough to spend January in Strasbourg at the University of Louis Pasteur I was drawn to historical reflections on the next 1,000 years of human endeavour. Seeing that this is the year of the Y2K bugs, perhaps we could piggy back our concerns over OC Bugs (oral cariogenic bugs). OCB's have been around for many a millennium and no doubt will be for the next few, but they haven't had us all as worried as the Y2K bugs! Pasteurisation. Y2Katisation. Oralisation. Will that be the answer?

The Annual Report of the ADA Inc makes very interesting reading. In particular, the reports of 'our' dealings with the Government. As noted in the report the almost complete lack of Federal Government involvement in any dental health programmes (barring the limited programmes for rural and indigenous people) is of great concern.

The less Government interfacing that occurs, the further we slip out of contention. However, one area where improvement occurred was the fee scales set for involvement in the dental programmes for rural and indigenous people. The IDCFA (Inter Departmental Committee on Fees and Allowances) did release a much improved, albeit discounted, fee schedule.

The report goes on to note the importance of our association with NHMRC, citing the release of "Infection Control in the Health Care Setting" as a valuable guide for us all. As well, there has been an inquiry into amalgam initiated, with a report due before the middle of the year, and another inquiry into fluoride and fluoridation has been initiated.

But wait there is more! Our involvement with Government goes on! The ADA Report notes three major enquiries participated in during the year; viz, the Senate Select Committee Inquiry in Public Dental Services, The House of Representatives Standing Committee on Family and Community Affairs Inquiry in Indigenous Health and the Senate Select Committee on Social Economic Consequent of National Competitors Policy. In this latter Inquiry, the ADA submission stressed the dangers of treating health provision as a business governed solely by economic rationalism. The advantages of regulation and restoration of practice to qualified personnel was stressed.

But wait, there is even more! If like me you have been confused by the whole reform agenda, who is inquiring about what and when, I found the summary by the ADA Executive Director Dr Rob Butler's in the February News Bulletin very helpful. To precis his report at present, there are two main Federal Government bodies who impinge directly on Dentistry.

The Competitors and Consumer Commission (ACCC) and the National Competitors Council (NCC). The ACCC "polices" provisions of the Trade Practices Act and Competitors Policy Reform Act. However, it cannot take action where the provisions of the Crown apply such as Dental Board Regulations.

The NCC is an advisory body of the Federal Government and is charged with making sure that State Governments reform their legislation to remove anti competitive elements. In this context the NCC is keen to see restriction of the privilege of the Crown to only those areas where any "anti competitive" rules are shown to be necessary for the public benefits. The pressure on the States to comply comes from threats to their Federally distributed Budgets. The result of such 'push' from the NCC has, amongst many other things, led to the Victorian Governments review of State Dental Legislation. As noted by Dr Butler in the Annual Report, other professions have suffered badly following deregulations. The Victorian outcome will be watched with great interest.

And so it goes on. Our Federal Representatives carry out a lot of time consuming and seemingly unrewarding work. People put in. The same spirit exists within our group and I know at the up coming joint Standards of Care Meeting with the AAPD all those attending will put in a great deal of time on preparation so we will be able to achieve significant outcomes.

On a less lofty level, I look forward to having all the Branch Nominees attend the Standards of Care meeting in Adelaide, 8th and 9th of May, for what will be a busy few days.

Au Voir!

Richard P Widmer

Western Australia

The Western Australian Branch Annual General Meeting and Dinner was held on 27th November 1998 at the Sebel of Perth. Branch President, Dr John Winters, in presenting his report, reflected with satisfaction on the activities of the year, in particular, the one day course held in October in conjunction with the Dental Therapy and Hygiene Association of WA entitled "Kid's Teeth: Let's Get It Right".

The following office bearers were elected for the coming year:

- President Dr John Winters
- Secretary /Treasurer
  Dr Alistair Devlin
- Committee Members
  Dr Kate Dyson
  Dr Mark Foster
  Dr Peter Gregory
  Dr Tim Johnston
  Dr Peter Readman

Members and their partners then enjoyed the fine fare of the Sebel. The after dinner speaker was Perth orthodontist, Dr Dick Cook, who spoke about 'Theatres of War of World War 1'. Dick has a very keen interest in these which has flowed from his own three decades of distinguished military service.

The Branch now looks forward to another busy year. A large contingent will be travelling to Melbourne to attend the International Traumatology meeting, there will be the annual meeting in July at Merribrook, near Margaret River, another one day course is planned for 29th October to coincide with the visit to the Branch by the Federal President, Dr Rick Widmer, and then there will be the Annual General Meeting and Dinner on 12th November.

Alistair Devlin.

federal secretary manager's notes

1. At the time of writing, there are a number of meetings involving the Federal Council of ANZSPD for which planning is in hand.

   The first of these will be the Council meeting on Thursday, 18th March, 1999 in Melbourne.

   The second will be the 'Standards of Care' meeting, to be held in conjunction with the Australasian Academy of Paediatric Dentistry, and this will be in Adelaide on the 8th and 9th May, 1999.

   The Federal Council will then next meet in Adelaide at the time of the 12th Federal Convention of the Society, in February 2000.

2. Members will probably be aware that the bid by ANZSPD to hold the IAPD Congress in 2003 in Sydney was unsuccessful.

   In late September, 1998, IAPD issued an invitation to member bodies to bid for the Congress of 2005. A postal/fax ballot was held of all ANZSPD branches, and it was agreed that ANZSPD accept this invitation to bid.

   IAPD was advised of this in early December, and in mid-February, IAPD forwarded a copy of the guidelines for bids. The only problem was the bid documents had to be submitted by the middle of March!

The 'Standards of Care' meeting will be held in conjunction with the Australasian Academy of Paediatric Dentistry in Adelaide on the 7th and 8th of May, 1999.

   Fortunately, the recent 2003 bid means much of the preparation has been done and needs only to be updated.

3. The Royal Australasian College of Dental Surgeons advises it has appointed the new Board of Studies for Paediatric Dentistry.

   The Convenor is the Registrar (Special Field Stream), Associate Professor Chris Daly.

   The College appointees are Dr Angus Cameron and Dr Jamie Lucas.

   The appointees of the Academy and Australian and New Zealand Society of Paediatric Dentistry are Dr Bernadette Drummond and Dr Kareen Mekertichian.

Alistair Devlin.

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Once dentine becomes exposed, loss of tooth tissue accelerates, becoming a particular problem in young children since the enamel and dentine layers of the primary dentition are much thinner compared to adults. Erosion may be either extrinsic or intrinsic in origin but the distribution of erosion around the mouth is the same from both sources, thus diagnosis of the aetiology relies primarily on patient history and dietary information[6].

The symptom of hypersensitivity tends to indicate that erosion is active as regular exposure to acid tends to remove the material blocking the dentinal tubule and so the dentine becomes sensitive[7]. Exposure of dentinal tubules and their subsequent colonisation by bacteria often leads to pulpal inflammation and sensitivity. In younger patients this rapid erosion is further exacerbated by the lack of secondary dentine and large pulp.

Erosion from extrinsic sources

Extrinsic agents most common in children are diet-related. Since the 1950's, a number of reports have linked acidic components of the diet to dental erosion, such as lacto-vegetarian diets, grape fruits, vitamin C tablets and acidic fruit drinks[1, 4, 6, 8]. Dietary erosion is seen frequently with a high intake of carbonated acidic drinks (eg sports drinks) often affecting the labial and palatal surfaces of anterior teeth. These surfaces/sites are where food and drinks take the longest time to clear, hence are at a particular risk, whereas the mandibular incisor region, which is subjected to increased salivary washing and buffering, is cleared relatively quickly[9].

Forty-two per cent of fruit drinks are consumed by children aged between two and nine years.

Drinks causing erosion

Acidic-drinks include beverages such as fresh fruit drinks, carbonated drinks, squashes/cordials, sports supplements, wines, herbal tea[2, 10]. Soft drink intake is much higher in young age groups. Soft drinks have been reported to provide about one-fifth of the added sugar in diets of 11-12 year old children. Forty-two percent of fruit drinks are consumed by children aged between two and nine years[9], however, the 'frequency rather then the total intake may be more important in the erosive process'[9]. Erosion is for example, more harmful if drinks are taken over a prolonged period from a feeding bottle used as a comforter.

Concerning carbonated beverages, it is the type and concentration of the acids present, which influence the erosive potential. Acids frequently found in drinks are citric, malic, phosphoric and carbonic acids. Vitamin C (ascorbic acid), considered a 'healthy additive' in many drinks, has been implicated in dental erosion[2,8]. The acid dissociation constant (pKa) is inversely related to the enamel demineralisation: thus citric acid is considered more destructive than malic acid because of its lower pKa.

Titratability (the ratio of ionised to non-ionised H+) and the pH (ionised H+) determine the erosive potential. The pH reflects the concentration of the hydrogen ions immediately available to attack tooth substance and may be a better indicator of erosion potential if the drink is consumed rapidly[2]. It is expected that presence of calcium phosphate and fluoride theoretically reduces demineralisation, however according to Milosevic[2], buffers in drinks such as sodium citrate usually counter balance the actions of salivary neutralisation of the acids.

Method of drink consumption is of importance as to how destructive it is on tooth surface; drinks taken from a glass require longer time to clear from the mouth than those consumed using a straw or a child's feeder cup, thus increasing erosion.

Hence, the occurrence of dental erosion from drinks is dependent upon several factors such as frequency of intake, method of drinking (sipping and swishing being most harmful), the temperature of the drinks (warm acidic drinks are more erosive than chilled ones) and the effectiveness of salivary buffering capacity.

Foods causing erosion

Acidic foods include fresh citrus fruit, pickled foods and certain sauces which contain acetic or citric acid. Vinegar (acetic acid) is commonly used on or with foods such as chips, crisps, salad dressing and prickles. Acids are also present in certain tinned foods such as baked beans or pasta. Kidd and Smith[10] have reported that spicy foods may also be erosive or provoke reflux, but Milosevic [2] believes that 'whether the erosive potential from these foods sources is significant probably depends on individual eating habits.'

Erosion from intrinsic sources

Intrinsic agents causing erosion are the gastric secretions regurgitated habitually or by recurrent vomiting, affecting the lingual and palatal aspects of the maxillary incisors and the occlusal and buccal aspects of the mandibular posterior teeth [11]. Intrinsic sources producing oral gastric secretions include gastro-oesophageal reflux disease (GORD), eating disorders (anorexia nervosa, bulimia nervosa), cyclic vomiting syndrome, voluntary regurgitation (rumination) and morning pregnancy sickness.

GORD is the most common disorder in adults. It was originally thought that erosion due to reflux was rare in children because common conditions of erosion due to reflux were found to occur in adults such as sickness in pregnancy, GORD chronic indigestion, 'heart burn', hiatus hernia and chronic alcoholism. Recent data have shown that this is not the case.[4,9,16,]

Regurgitation in infancy is common and does not usually persist into adulthood[12]. Long-term regurgitation was associated with learning difficulties, failure to thrive, feeding problems, oesophagitis, anaemia, stricture formation, or recurrent pneumonia secondary to aspiration. Early recognition of this disorder is paramount importance so that related problem including dental erosion can be prevented.

It was originally thought that erosion due to reflux was rare in children... but recent data have shown this is not the case.

Regurgitation has been linked to cerebral palsy[12]. The association between learning difficulties (mental handicap) and gastro-oesophageal reflux was first postulated in 1957 and there is now some evidence to link cerebral palsy with reflux activity. The cause of regurgitation in people with handicaps is unknown, but possible contribution factors present in cerebral palsy patient have been postulated as being: incoordination of swallowing, kyphoscoliosis, prolonged recumbency and presence of extension spasm[9].

Eating disorders

As socio-cultural diseases affecting mainly upper-middle class, white females between 12-30 years, eating disorders are characterised by disturbance of body image with an overtaking desire to reduce weight.

Eating disorders such as anorexia and bulimia nervosa causes extensive erosion of the palatal aspects of maxillary incisors. This is called '*perimolysis'*, and is thought to be due to the tongue directing gastric contents forward during vomiting while the lateral aspect of the tongue protects the mandibular teeth[1,12,,13,14,15].

Patients with eating disorders brush their teeth frequently after each vomiting episode, leading to increased tooth abrasion[16]. The effects of acid, whether from the diet or from the stomach, on softening the enamel and dentine is compounded and modified by tooth-brushing[22]. If demineralised tissue is brushed, abrasion accelerates until the demineralised layer is removed.

Although the dental problem of patients with eating disorders can be recognised easily, initiation of medical help is often a sensitive issue, as patients are often in denial of their problems. Restorative dental treatment should be delayed until the eating disorder is controlled or restorative procedures will likely fail[17].

Approximately 0.5% of the female population from 11-18 years of age suffers from anorexia nervosa. Bulimia is more common occurring in 1% of females, but little is known of the extent in males. Despite being two different conditions, both include self-induced vomiting (SIV) as a means of purgation[2,18]. Gastric acid contains 0.4% hydrochloric acid, and even when diluted with food, regurgitated stomach contents have a high acid content leading to tooth erosion[9].

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These eating disorders may show periods of exacerbation and quiescence reflecting variations of frequency and duration between individuals but the frequency and duration of SIV episodes and the total number of their vomiting episodes are not linearly associated with erosive toothwear. Factors such as the quantity and quality of saliva affect the tooth wear process[19]. Metabolic disturbances secondary to bulimia nervosa may result in bicarbonate reduction thus reducing the buffering effects of saliva hence increasing patients susceptibility to erosion[17, 19].

Patients with eating disorders may develop xerostomia caused by vomit-induced dehydration or fluid imbalance caused by diuretics, appetite suppressants or anti-depressants taken to control weight gain [20]. The loss of lubricating and buffering effects of saliva may potentially effects other aetiological factors like rampant caries development[19]. Similarly, many medicines have xerostomic effects, or produce nausea and vomiting leading to alterations in physiological and pathological toothwear[23]. The taking of the drug Ecstasy has also been implicated in toothwear in teenagers[2,23,24].

Cyclic vomiting syndrome

Although the aetiology is unknown, a prevalence of 1.9% of cyclic vomiting syndrome has been reported in Scottish school children[2]. The essential diagnostic criteria include recurrent, severe, discrete episodes of vomiting with intervals of normal health occurring between episodes. The duration of vomiting may be hours to days. This syndrome, however, is not an eating disorder. The onset occurs from preschool years and appears to be self-limiting, but its duration is unpredictable. It has been associated with symptoms of nausea, abdominal pain, motion sickness and photophobia[2, 9].

Approximately 0.5% of the female population from 11-18 suffers from anorexia nervosa.

Voluntary regurgitation

Rumination of gastric contents into the mouth has been reported in infants, children and adults. Many factors may bring on precipitation of rumination, including childhood neglect, abuse and other psychosocial stress[2]. The gastric refluxate is often held in the lower pouch, either unilaterally or bilaterally before being swallowed again, thus causing erosion on the adjacent buccal sites of canines and premolars as well as palatally.[21] If the gastric content is related to meal-times the gastric refluxate is re-chewed before re-swallowed, and this leads to a more generalised distribution. The regurgitation of gastric contents is not however, always related to meal-times[21]. Little information is currently available regarding the rumination syndrome.

Attrition

Very severe tooth wear is often seen with a combination of erosion and attrition. Attrition is characterised intra-orally by enamel and dentine wearing at the same rate leading to worn surfaces that match in closed eccentric movements. Shiny amalgam restorations are present in areas of centric and eccentric contact. Attrition may lead to masseteric hypertrophy, cuspal and restoration fractures and increased risk of tooth mobility[2]. Attrition usually occurs on the occlusal surfaces, incisal edges and lingual surfaces of maxillary anterior teeth and the labial surfaces of mandibular anterior teeth.

The rubbing together of two opposing tooth surfaces may lead to empty mouth clenching and empty mouth griding called bruxism. Bruxism is a common para-functional activity in response to stress.

Klineberg[25] after considering the aetiology and management of bruxism, postulated that malocclusion was not a trigger for bruxism, and introduced 'thegosis', a term he described to be the biological basis for toothwear rather than a pathological basis. He stated that 'restorations must be compatible with adjacent tooth wear pattern'[25].

Murray[26] in his review on thegosis concluded that there is evidence for tooth sharpening for anterior teeth in many species as a social behaviour activity.

Stress was postulated as the cause of non-masticatory tooth-tooth contact, suggestive of excessive tooth grinding and clenching and that bruxism and pathological thegosis is synonymous for this activity. No evidence for posterior tooth sharpening mechanism indepent of masticatory function was evident.

In general, maxillary teeth is more susceptible to erosion than mandibular teeth, whereas in attrition the maxillary and mandibular enamel/dentine wear rates must be the same because of the contact of opposing surfaces resulting in matching wear facet. These facets can be analysed by determining the retruded contact position and intercuspal position, and from intercuspal position to lateral, protrusive and laterotrusive mandibular positions either on the patient or on an articulator.

Abrasion

Abrasion is considered to be toothwear that occurs during mastication. Different foreign bodies produce different patterns of abrasion[11]. The effects of abrasion may be exacerbated by erosion because enamel and dentine which have been demineralised by acid, are more susceptible to the effects of mechanical forces. In children, abrasion of tooth surfaces is uncommon: the most frequent type is toothbrush-induced and which increases in incidence with age[8].

Abrasive particles in food can wear composites extending into the buccal and lingual 'sluiceway grooves'[2]. Once the teeth are brought together, these particles because trapped acts on the occlusal contact area[27]. There are little data available on the abrasiveness of food and its implications on toothwear during mastication, however, modern diets are considered to be softer than in previous eras. With the increasing popularity of vegetarian diets and certain food fads, certain groups of the young populations may be susceptible to dietary abrasion/erosion of teeth[28].

It is important to recognise the problem of toothwear at an early age.

The distribution of toothwear lesions may indicate the main aetiology, because causative factors have a primarily environmental pattern relating to the position of the tooth in the mouth. Genetic or developmental abnormalities such as dentinogenesis and amelogenesis imperfecta, which produce poor quality enamel or dentine, may predispose to excessive loss of tooth surfaces as a result of physical or chemical wear. Oral habits or parafunction of which the patient is unaware may further contribute to the damage[28]. Drawing a patient's attention to the damage caused by habits which they are unaware of often leads to cessation and prevention of further toothwear.

Cervical stress lesions

Abfraction[29] is a result of eccentric occlusal load leading to cuspal flexure, resulting in compressive and tensile stresses at the cervical fulcrum area of the tooth. Various terms have been used to describe these processes, including cervical erosive lesion, non-carious cervical lesions and abfraction[29,30,31].

These tensile stresses weaken the cervical hydroxyapatite and predispose the cervical enamel to erosion[30]. This concept however has not been proven by experimental data, but is merely a hypothesis and are supported because 'they cannot occur due to heavy handed tooth brushing abrasion due to only affecting single tooth (not adjacent teeth) and the presence of gingivitis'. Lesions are deep, narrow and V-shaped and do not allow toothbrush to contact the base of the defect[32, 33]. These lesions are more common in adults than children.

Management of affected dentitions

It is most important to recognise the problem of toothwear at an early stage; identification of children with clinical evidence of toothwear means a possible assessment of aetiology can be made, hence enabling tailored advice for the individual. The dental practitioner should provide diet counselling if the problem appears to be diet related.

Recommendations for the clinician

The following advice should be given to patients:

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- Limit acidic foods and drinks to mealtimes; particularly avoid drinking or eating before bedtime or during the night and reduce frequency of episodes of intake[2],
- Avoid swishing, frothing or sipping drinks in the mouth - instead use a straw,
- Finish meals with a food which neutralises the acid such as cheese, milk or water[1],
- Chill drinks as the erosive potential may be slightly lower than warmer drinks[4],
- Avoid toothbrushing immediately after a meal when consuming acidic products. Teeth should be cleaned BEFORE that meal or delay tooth cleaning until bedtime[3],
- Frequently (daily) use a low-concentration topical administration of fluoride from toothpastes, gels and mouth rinses. Fluoride reduces demineralisation, promotes remineralisation during erosion and also precipitates fluoridated hypoxyapatite and fluroapatite, and
- Increase salivary flow and intra-oral pH by chewing sugar-free gums, rinsing the mouth with liquid antacids especially after vomiting or regurgitation, and applying topical application or bicarbonate-containing toothpaste. In severe cases, particularly involving those with gastro-oesophageal reflux or parafunctional activity (bruxism), an occlusal splint may be constructed and filled with magnesium hydrochloride or sodium bicarbonate to be worn by patients during danger periods to neutralise acid reflux[3].

Failure to establish the diagnosis of pathological toothwear can have severe consequences for the occlusion and aesthetics of the dentition.

Clinicians need to:

- Take standardised photographs and study casts with silicon rubber index, to help accurate monitoring of tooth tissue loss, and
- Modify patient's inappropriate oral hygiene practices and recommend usage of toothpastes with low abrasiveness for sensitive teeth as a commonsense preventative measure[8].

For case with sensitivity indicating active erosion/abrasion, the clinician needs to:

- Recommend an appropriate brand of desensitising toothpaste,
- Apply appropriate varnishes such as Duraphat, and
- Bond resin to the dentine of the patient's affected teeth to seal the worn surfaces, thus sealing the exposed dentinal tubules[9].

In extreme cases, pulpal exposure may occur, further complicating management. Pulpal extirpation and root canal therapy is best avoided, especially in the young, because of the risk of endodontic failure and long-term maintenance problems.

Aesthetic concerns

Anterior toothwear often leads to significant aesthetic changes which may lead to low self esteem especially in the young. Loss of enamel can increase the visibility of underlying dentine producing a more yellow tooth colour.

Restorations of anterior teeth usually require veneers, composite resin or porcelain. If the buccal and lingual surfaces of teeth are affected, full coverage crowns may be indicated.

Continued tooth fracture may lead to fractures of the enamel and shortening of teeth. Berry and Poole[34] suggests that 'occlusal toothwear is compensated by alveolar growth', which helps to 'maintain the occlusal vertical dimension (OVD) providing space available to restore the worn palatal, occlusal or incisal surfaces'. However if the rate of loss is greater than the compensating mechanism leading to a reduction in OVD, the OVD needs to be restored to allow restorative options.

It is paramount that in the young the technique used to create space does not lead to excessive loss of tooth structure. Methods available to develop increased interocclusal clearance include orthodontic tooth movement, changing vertical dimension or occlusal equilibrium and tooth preparations.

Conclusion

The worn young dentition presents the dentist with difficult management problems very different to those encountered with carious lesions. Careful observations and early diagnosis are paramount in early and effective management of affected dentitions. Failure to establish the diagnosis of pathological toothwear can have severe consequences for the occlusion and aesthetics of the dentition. Following correct diagnosis sufficiently early, a range of palliative, therapeutic and restorative options can be instituted in case management.

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sports dentistry

BY DR NINA VASAN BDS (OTAGO), MDSc (MELB), FRACDS

Australian and New Zealand Society of Paediatric Dentistry
Postgraduate Essay Competition Winner, 1998

Sports dentistry has been described as the practice of preventing and treating dental sports injuries and related oral disease.[1] With the increasing participation of children and adolescents in sports, the field of paediatric sports dentistry is expanding rapidly. The Academy of Sports Dentistry was developed in 1983 in the United States to promote sports dentistry by maintaining continuing education for dentists, as well as being involved in nation-wide campaigns to prevent sports injuries.[1] Currently in Australia and New Zealand there is no similar organisation despite the need for dentists to become involved in all aspects of paediatric sports dentistry to provide a high standard of care to this group of patients.

The role of the dentist is to provide athletes with the best possible protection and treatment of sports-related dental trauma and disease. This may be achieved by screening children and adolescents involved in sports during the pre-season to detect dental abnormalities; providing immediate and long-term management of dental injuries; and being involved in the prevention of sports injuries, as well as the management and prevention of caries and dental erosion related to sporting habits and diets. This paper will review sports dentistry with particular reference to current knowledge in sporting habits, sports injuries, and sporting diets.

Sporting habits

As our western society becomes more health conscious, children are being encouraged to participate in sports at an early age.[2] Being physically attractive and athletic is a desirable goal for many adolescents.[3] Sports habits have changed over the past two decades and are important issues in the 1990's as children and adolescents are influenced by peer pressure, the media and role models. The gymnasium has become a popular place for adolescents to attend where equipment is available to improve fitness, personal trainers can formulate individual exercise programs and nutritional products are sold.

A greater range of new competitive and recreational youth sports has developed recently, such as snowboarding, roller blading, skateboarding, mountain biking, rock climbing, water sliding etc. These have gained popularity throughout the world although traditional sports such as ice hockey and gridiron are still popular in the United States, whereas rugby and football are popular in Australia and New Zealand. Female participation in sports has increased particularly in basketball and netball where the participation has doubled in the last 5-7 years.[4] Pressure from parents or coaches may be placed upon players to be the best and 'win at any cost'. Hence, athletes rely not only on intrinsic ability and genetic endowment but are constantly seeking to improve performance through better

exercise and nutrition. The 'sports team' approach with a personal trainer and sports nutritionist has become popular to improve individual performance.

From a dental perspective sporting habits may be divided into 'good habits' such as routinely wearing protective equipment, and 'bad habits', such as the pattern of consuming carbohydrate foods and drinks, eating disorders associated with maintaining low weight, and the use of anabolic steroids. Good sporting habits include routinely wearing protective equipment such as mouthguards and cycling helmets. Unfortunately, this is not practiced by all athletes. Contact sports like boxing and rugby have a high usage rate of mouthguards.[5] However, many other sports such as soccer, netball and basketball have not followed this example.[5]

Bad sporting habits involving frequent consumption of sports drinks, and carbohydrates or ergogenic aids are now common. Children and adolescents may be influenced by what other athletes eat and drink, or what the latest trend is. Cyclists and endurance runners often carry 'energy foods' such as bananas or 'Power or Muscle bars' (Musaschi™) which are marketed as protein-building bars, slim bars, and endurance bars. These carbohydrate foods are consumed regularly throughout their athletic event.[6] They may also wear a 'camel back', which is a bottle device attached to the athlete's back containing a sports drink with an attached long filter/straw into the mouth. This allows fluid consumption on demand. Swishing the fluid or holding it in the mouth before swallowing is a habit performed by some people.[7] The dental significance of these habits is that some individuals may be predisposed to developing caries and erosion. This is further discussed below under sports diets. Swimmers may be at risk of dental erosion in pools with a low pH due to inadequate maintenance.[8]

Performance improving (ergogenic) aids such as amino acid supplements, creatine, carnitine, 'enzyme Q10' etc have increased in consumption.[9] The endorsement of top athletes by manufacturers and emotive advertising encourages consumption of these products.[10] There is little scientific evidence that these ergogenic aids are effective performance enhancers in humans, and the long-term side effects and dental effects are unknown.[10]

Eating disorders such as bulimia or anorexia nervosa may be seen in the adolescent athlete.

Adolescents may use anabolic steroids for the perceived beneficial effects of increasing skeletal muscle mass and strength. Since the day in 1988 when Ben Johnson was stripped of his gold medal at the Seoul Olympics, steroid usage has become more public. The abuse of steroids can result in hypertension, blood clotting abnormalities and aggressive behaviour.[11] In the United States, adolescent steroid users were found to be engaged in multiple drug use more than non-users.[11] A common symptom of chronic steroid abuse is increased muscle mass developing over a short period of time. Adolescents abusing steroids require substance abuse counselling.[11] Dental management of these patients may be difficult if mood swings are common with good oral hygiene behaviours difficult to develop, oral surgery may be complicated also by bleeding problems. Injected steroids through shared needles place adolescents at risk of transmitted diseases, as well as dentists treating them.[12]

Eating disorders such as bulimia or anorexia nervosa may be seen in the adolescent athlete, especially females where there is pressure to maintain or reduce body weight for physical reasons in some sports (running, cycling) or for aesthetic reasons in sports like gymnastics or ballet. The cycles of 'binge-eating' and self-induced vomiting seen in bulimia may cause dental erosion from gastric acids.[3,13] The dentist may be the first health professional to make a diagnosis.[14] Appropriate referral to a physician for medical treatment, nutritionist for dietary counselling and psychiatrist for further counselling is required.

Habit Interventions

Habit interventions need to be directed towards the individual, coaches, schools, sports teams, manufacturers, national sporting bodies and the government. Education of the individual on the effects of sporting habits so that informed decisions can be made is important to minimise these habits being continued through adulthood. Steroid education programs at schools should be promoted.[15] National sporting bodies can implement stern drug testing measures at competitive events, to protect the health

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of the athlete and ensure fair competition. The government can also be involved by providing funding for research into ergogenic aids and ensuring manufacturers provide accurate information when advertising products.

Sports injuries

Recently, in the United States it was stated that increased competitiveness in youth sports has led to a higher prevalence of dental injuries than in previous years.[16] Earlier, in a study by Hall (1970-1979) at the Royal Children's Hospital, Melbourne it was found that sporting accidents accounted for the majority of injuries to young permanent teeth in the age group 5-15 years.[17] The frequency of dental trauma occurs with a male:female ratio 2:1, although in some sports females may be more susceptible to dental injury since it has not been traditional for them to wear mouthguards.[18] Maxillary central incisors are the most common teeth involved.[19,20]

In Australia and New Zealand, contact sports are responsible for the majority of dental trauma, but there is an increasing number of injuries occurring in recreational sports.[21] Predisposing factors for dental sports injuries include participating in heavy contact sports without mouthguards and a Class II division 1 malocclusion.[19,20] Wheelchair athletics has increased in popularity and recent studies show that this group of junior athletes are also prone to dental injuries. The dentist should have appropriate facilities to treat wheelchair bound patients in the dental practice.[22]

Sporting injuries often present as an emergency to the dentist requiring rapid management. The type of dental injury which occurs is related to the magnitude and direction of the impacting force. Facial bone fractures in children are uncommon due to the young elastic bone, although condylar fractures may occur from an impact to the chin.[19,23] Soft tissue lacerations, or degloving, may occur if a child slides onto the ground. Intraoral dental injuries may involve dentoalveolar, crown and/or root fractures, commonly from a direct horizontal/oblique force. If the impacting object is cushioned by the lip or has less force, then luxation injuries are more common.[21]

In children these injuries often involve immature teeth in a mixed developing dentition.[24] Successful management requires an adequate knowledge of the biological healing of dental tissues, restorative and pulpal treatment options and behaviour management of the young patient. Management of any dental injury involves immediate assessment and treatment followed by long-term monitoring, and advocating preventive measures to avoid future injuries.

Management of Orodental Injuries

Firstly, a history of the event and medical history should be obtained. If the injured child is brought directly to the dentist, a neurologic assessment is required.[25] Any sign of head injury should be referred for medical evaluation. Nitrous oxide should not be used until the clinician is fully satisfied that there is no neurological impairment.

The history of when, where and how the injury occurred should be recorded, as this may influence treatment. The child's anti-tetanus status should be ascertained and any lost teeth need to be accounted for, as these may be intruded, inhaled or swallowed.[25] A chest radiograph may be required. Following an extraoral and intraoral examination, radiographs should be taken to assess the nature of damage and developmental status of traumatised teeth. If foreign bodies are suspected, soft tissues should be radiographed at one quarter of the normal exposure. Photographic documentation is valuable for a baseline record, and future insurance claims.

If the dentist is unable to treat the patient adequately in the practice, or if the severity of injuries necessitates specialist care or a general anaesthetic, the patient should be transferred to a hospital. Simple crown fractures are restored with composite resin or the fragment reattached.[19] Complicated crown fractures where the pulp is exposed require pulp therapy.[19,20] The stage of root maturation and pulpal status is important when choosing between pulpotomy and pulpectomy.[19,24] In immature teeth an effort should be made to preserve pulp vitality, to promote apexogenesis, so the tooth may mature, resulting in a stronger tooth that is more resistant to subsequent fractures. A Cvek pulpotomy is indicated for these teeth. If the pulp of a traumatised immature tooth is necrotic, apexification with

calcium hydroxide is required to promote an apical hard tissue barrier against which the root canal filling can be placed.[20]

The principles of treating root fractures in permanent teeth focus on reduction of the displaced coronal fragments and immobilisation by rigid fixation.[24] High apical root fractures and incomplete root fractures in immature teeth often require no treatment. Severely luxated teeth require repositioning and stabilisation with flexible splinting.[20] Early repositioning of intruded permanent teeth is important to avoid ankylosis, and allow palatal access to the tooth for endodontic treatment.[20] However, if the crown of an immature tooth remains visible, the tooth may re-erupt spontaneously.

Avulsion of a maxillary central incisor is a serious sporting dental injury common in school age children where the root is immature and the alveolar bone elastic.[26] In the mixed dentition, reimplantation of even questionable teeth allows normal establishment of the arch and occlusion.[20] These teeth are often lost by replacement resorption, which preserves the alveolar bone height, making prosthodontic replacement easier. Emergency treatment involves rinsing the tooth with saline, then replanting and splinting (flexible) for 7-10 days. Antibiotics are recommended.[26] Endodontic therapy should be commence within 10 days. If the tooth has been, replanted within a short period and the apex is very immature, revascularisation may occur and endodontic treatment is needed only if signs of pulpal necrosis arise. The prognosis for a replanted tooth is improved by decreasing the extraoral time period, appropriate storage media (saline, milk) and reducing mechanical damage to the root.[20]

The long-term management of sports injuries involves regular reviews of traumatised teeth. Parents should be advised of possible such as loss of pulp vitality, root resorption, apical osteitis, ankylosis, etc which may lead to loss of the traumatised tooth.[21] Recent treatment options for anterior tooth loss include auto-transplantation of teeth, resin-retained bridges or osseointegrated implants.[19] These procedures require a multidisciplinary approach with other dental specialists.

A dentist may become affiliated with a sports team and advocate compulsory oral protection.

Prevention of Sports Injuries

Preventing sporting injuries is important if the prevalence of these injuries is to be reduced. Education and the use of mandatory safety equipment for sports is required. Education about primary care for dental trauma should be directed at parents, teachers, and sports teams.

The correct protocols and tooth trauma kits such as Dentist in A Box™ for immediate replanting of avulsed teeth, should be available to all schools and sports teams. A dentist may become affiliated with a sports team and provide on site emergency treatment, and advocate compulsory oral protection. Adolescents who are more likely to resist the use of protective gear during casual sporting activities because of peer pressure, may be influenced by well known athletes advocating protective sports. The dentist can also become involved in nation-wide campaigns held by dental associations directed at the community to improve sports dentistry awareness. In the last few years, the Australian Dental Association has promoted 'Dental Health Week' with sports dentistry being the topic for 1998. Commercial sponsors like Oral-B and Colgate provide support so dental health information is conveyed to the community through the media. Dental schools should include sports dentistry education into the curriculum of dental students.

Injury-susceptible patients should be recognised by asking all children and adolescents about their physical activities and whether a mouthguard is worn.[27] For patients with Class II division 1 malocclusions, the dentist should explain the benefits of orthodontic treatment to reduce trauma risk. Removable orthodontic appliances should not be worn during sports to avoid dislodgment and airway obstruction. Impacted third molars create areas in the mandible which are susceptible to fracture in a traumatic event. Older adolescents involved in contact sports should be advised to have impacted third molars removed.[28]

Mandatory protective equipment for sports, training sessions, and recreational activities should be encouraged. The best means for preventing intraoral trauma in sports is the mouthguard.[29] The mouthguard is made from thermoplastic materials and usually worn on the maxillary arch. The Academy for Sports Dentistry recently listed[40] sports in which mouth protection would be advantageous for

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the participant.[29] Currently in Australian football codes there is no national regulation for compulsory mouthguard usage.[28]

Wearing a mouthguard has several advantages. It protects teeth and intraoral structures and reduces the incidence of dental injuries by spreading the force of impact over all the teeth covered by the mouthguard, stopping traumatic contact between the maxillary and mandibular dentition.[30] It also lessens the risk of concussion occurring from impact to the mandible because full posterior translation of the condyles is prevented, reducing the force transmitted from the condyles to the base of the skull.[28,30] A recent development has been the bimaxillary mouthguard which gives increased dental protection, and reduces the risk of mandibular fractures. It can be used in boxing and martial arts.[28] Patients with fixed orthodontic appliances can have custom-made mouthguards using a model coating technique or commercial bimaxillary mouthguards (Doubleguards™, Massel) are also available.[31] Coloured mouthguards can be made to match team colours making them 'trendy' to wear, and recent flavoured mouthguards overcome the 'rubber' taste.

Unfortunately, not all athletes wear mouthguards. Common reasons for this include: discomfort, lack of retention, and impairment of normal breathing and speech. A stock one-size-fits all mouthguard does more harm than good due to the imperfect fit to different arches. A custom-made mouthguard eliminates most complaints as it fits better and is well retained, hence custom-made mouthguards are advisable for all patients participating in sports.[20,32] Up to the age of 17, eruption of teeth and jaw growth necessitate replacing mouthguards almost each year.[28] Promotional messages to increase mouthguard usage can be placed in sports journals and newspapers[33] even the internet.

Up to the age of 17, eruption of teeth and jaw growth necessitate replacing mouthguards almost every year.

Sports diets

Sports nutrition has advanced into a complex discipline. The diets of competitive athletes consist of varying amounts and frequency of carbohydrate, protein, fat, vitamins and minerals to meet their energy needs. Recent Australian and New Zealand nutrition guidelines for physical fitness generally recommended that 60-65% of total energy should come from carbohydrate, and less than 30% from fat to maximise muscle glycogen stores.[2,34,35] The dental significance of these diets is the high frequency of potentially cariogenic and erosive foods may predispose the athlete to caries and dental erosion. Groups at risk include those involved in endurance sports (marathon running, triathletes), cycling, and strength activities (weight lifting, bodybuilding).[36]

The diets of athletes are related to their energy needs which, depend on the intensity, duration, and type of exercise performed.[3] Individual eating plans with frequent eating are designed for these athletes. Eating a series of small meals and snacks during the day is recommended to increase energy intake, while reducing the gastric discomfort of infrequent large meals.[14,37] Triathletes and runners have on average 6-9 eating occasions daily, with more than 90% of swimmers having 8-10 eating occasions daily.[14] These foods include commercially available sports drinks, fruit, confectionery, bread, cakes, chocolate etc.[37] Liquid supplements (Sustagen™, GatorPro™) are used to provide a high-carbohydrate meal in an easily delivered, ready-to-consume package.[6,35,37] After exercise, carbohydrate consumption is encouraged to ensure repletion of muscle glycogen. The use of amino acid and protein supplements by athletes is common, despite the lack of well-controlled clinical studies to justify their use.[35] Some of these supplements are sweetened liquids and potentially cariogenic. Dietary considerations for children who exercise regularly differ only in the need to maintain adequate caloric intake for optimal growth.[2,35] Children require adequate hydration as they have a greater surface area and lower sweating capacity then adults, and as a result are more susceptible to hyperthermia.[35]

Hydration is also important to prevent dehydration, which adversely affects muscle strength, and coordination, impairing performance. Sports nutritionists recommend frequent fluid replacement during exercise at a rate sufficient to replace water lost through sweating.[38] Sports drinks are formulated to provide a convenient and palatable source of fluid with a 4-8% carbohydrate level and electrolytes to promote fluid balance and hydration during exercise.[38] Sports beverages have become popular for athletes, and recreational exercisers, and are the fastest growing segment in the Australasian drinks market.[38] The most popular sports drinks in Australia are Gatorade™, Sports Plus™, and Powerade™ all of which have a pH below the critical pH 5.5 for enamel demineralisation.[39,40]

Dental significance of sports diets

Interaction between caries and erosion has been more commonly observed following the increased usage of sugar and acid containing sport drinks during exercise when, due to mouth breathing, there is less salivary clearance of acids and carbohydrates.[41]

Dental caries

In sports diets the frequency of consumption of fermentable carbohydrates is increased and athletes are often resistant to making dietary changes, if performance may be affected. The patient should be advised to adhere to strict preventive measures. A caries risk assessment should be performed which includes a fluoride history, past caries experience, diet history, chair side saliva tests (flow and buffer capacity), and bacterial counts. An individual treatment plan can then be formulated. Preventive measures should be directed at making tooth surfaces less caries susceptible with fissure sealing and good oral hygiene. Topical fluoride treatments may be needed to prevent enamel demineralisation and promote remineralisation. Sugar-free chewing gum can be used to stimulate salivary flow and neutralise plaque acids. The dentist should stress to the patient/parent the risk of caries with their current sports diet and encourage regular dental reviews.

For very high risk patients, a sports nutritionist should be consulted to discuss dietary option to prevent caries and erosion.

Dental erosion

Dental erosion describes a chronic loss of dental hard tissue chemically etched away from the tooth surface by acid without bacterial involvement.[42] The clinical features of erosion include: diminished lustre of enamel, 'proud' restorations as surrounding tooth structure is lost, and sensitive dentine.[41]

The erosive potential of sports drinks have been investigated in vivo and in vitro, and is related to their low pH, titratable acid content, and chemical composition.[8] The frequency of intake and salivary flow rate are also important factors.[43] Dehydrated athletes will have a reduced saliva flow rate which tends to increase the erosive potential of acidic solutions. Erosive lesions have a hypomineralised surface. Although softening of the enamel may not be detected clinically, erosion decreases the wear-resistance of dental hard tissue,[44] rendering enamel and dentine more susceptible to the effects of mechanical abrasion. As a consequence, erosion may be exacerbated by mechanical abrasion, such as toothbrushing immediately following an acidic challenge.[45]

The prevention of dental erosion is importance because of the difficulties in its early diagnosis, and, once clinically detected, its irreversible nature. Treatment of the condition is challenging, especially in young children.

Management includes restoring missing tooth structure, preventing further tooth tissue loss and maintaining a balanced occlusion.[46] Recently, nickel-chrome onlays are a conservative means of restoring tooth loss and maintaining occlusal vertical dimension in children and adolescents.[47] Erosion-related sensitivity can be reduced by tooth coverage with glass ionomer and/or topical fluoride application.[46] If the frequency of sports drinks consumption is unable to be altered, practical advice is directed at enhancing defence mechanisms. This includes use of sugar-free chewing gum to increase saliva flow, reducing abrasive factors (whitening toothpastes) and avoiding toothbrushing directly after consuming sports drinks so the erosion is not exacerbated by mechanical abrasion. Minimising the effect of the acids with neutral fluoride mouthwashes and consuming neutral foods with high

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calcium/phosphate content should be advised.[41] Chilled drinks are potentially less erosive because the acid dissociation constant is temperature dependent and the use of a straw will reduce the contact with teeth.[42]

Regular reviews are required to monitor the rate of tooth tissue loss with photographs and study models. Salivary flow rate and pH should also be monitored. For very high risk patients, a sports nutritionist should be consulted to discuss dietary options to prevent caries and erosion, for example using xylitol containing foods. Recent studies have shown xylitol and fluoride to have an additive effect in the reduction of erosion.[48] There is increasing interest in ways in which potentially erosive beverages might be modified.[49] The addition of casein phosphopeptides into sports drinks may have future potential as a protective agent against dental erosion.[50]

Conclusion

In summary, sports habits, injuries and diets represent three areas of growing importance in the field of sports dentistry. Recommendations for the clinician include early identification of sports injury-prone patients by regular dental reviews pre- and during season, fabrication of protective mouthguards, and providing advice to athletes, parents and sports leaders on management and prevention of sports-related oral diseases. The emphasis is on education which is the key to reducing dental damage. Today's athlete will become tomorrow's coach.

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a tale of two toothaches

The most unequivocal evidence that our dental treatment efforts have been unsuccessful is the development of an acute dental abscess within weeks of treatment. Two such cases have come to my attention recently in which children presented for emergency dental extractions soon after completing a course of restorative dental treatment. Both cases subsequently became the subject of parental complaints to government agencies.

In one case, a preschool aged child was taken to their general practitioner dentist after management problems had forced the abandonment of treatment at a school clinic. The dentist recognised the full extent of the dental problems and recommended that the child see another practitioner who could carry out all of the required dental treatment under a general anaesthetic. The parents declined this referral because of financial barriers and requested that the dentist do the best they could. Radiographs were attempted but were not diagnostic because of continuing management problems, and only a limited portion of the required treatment was carried out with difficulty before treatment was again abandoned. Within three months the child developed an acute facial cellulitis from one of the treated teeth and required an emergency dental extraction under general anaesthetic.

In the other case, another preschool child was referred to a specialist paedodontist after management problems had forced the abandonment of treatment at a school clinic. The parents declined the specialist referral because of financial barriers, but rang the general practitioners in their area until one was found who would admit the child to a Public hospital and provide treatment at a lower cost. Unfortunately there were no dental radiographic facilities at the chosen hospital, and the dentist was not aware of the techniques for using the portable medical radiography unit, and so no radiographs were taken at all. The dentist had undertaken to carry out pulpotomies on all of the first primary molars. Instead they only carried out direct pulp cappings and chose to leave extensive residual caries under glass-ionomer cement restorations at the time of general anaesthetic.

There is a diversity of opinion among dentists about the 'best' treatment for any clinical problem.

Within three months the child developed an acute facial cellulitis and required an emergency extraction under general anaesthetic. One week later they re-presented with an acute facial cellulitis on the opposite side and the opposite jaw. The distraught family consulted the specialist to whom they had originally been referred and the child had their third general anaesthetic in as many months for dental treatment. A full examination under general anaesthetic including dental radiographs revealed severe marginal leakage around the glass-ionomer restorations and residual caries, with furcation pathology on the three remaining first primary molars. There was additional and previously undetected caries in the second primary molars and primary canines. The three first primary molars were extracted to provide a predicatble and certain resolution to the presenting complaint. All other carious lesions were restored using standard techniques.

While there is a diversity of opinion among dentists about the "best" treatment for any clinical problem, and it is true that every clinical technique has a failure rate (although the vital formocresol pulpotomy and dental extraction almost reach 100% clinical success rates), it is obvious that certain clinical choices will clearly increase the risk of failure. Examples include lack of diagnostic records, direct pulp capping in the presence of residual caries, and endodontic therapy without protection from coronal microleakage. These are some of the many issues which could be could be addressed as standards of care.

These cases also highlight that general anaesthesia *per se* is not a panacea for children's dental problems. The complete oral rehabilitation under general anaesthetic requires a

structured approach to treatment. Unless higher quality and more predictable dental treatment can be carried out, there is no justification for the additional cost and risk of general anaesthesia. Alternatively, choosing to go ahead with clinical treatment against one's own clinical judgement as in the first case will still lead to parental dissatisfaction if complications arise or if treatment fails. Because the most common reason for declining complete oral rehabilitation is cost rather than concern over any risks associated with general anaesthesia, there is an equity of access problem to be addressed.

As government agencies take an increasingly close interest in the activities of dentists and even question our existence as a profession, it is well that we should be planning to meet and review our standards of care. At a political level, within both state and federal health departments, there is an obvious and artificial distinction made between health care and dental health care, yet we know that acute infections can make children very sick and lead to emergency dental admissions even if they do come from a humble "baby" tooth.

It is hard for us to approach health departments with this mind set to address issues of equity of access to health care, and it will be impossible unless we have a coherent and cohesive policy on our standards of care. It should not necessary for us to "reinvent the wheel".

children are victims of dental crisis

Justin Rowlat

UK News from the Guardian Weekly 31st January, 1999
Submitted by Jamie Robertson

The level of decay in children's teeth is increasing for the first time in decades, and health authorities blame this on the shortage of dentists prepared to undertake National Heath Service work. In some areas of Devon the incidence of tooth decay among five-year-olds has doubled according to the health authority. Hampshire reports the incidence of decay among twelve-year-olds has increased steadily over the past six years. In some parts of the country, a third of all twelve-year-olds have untreated decayed teeth.

In Cornwall, Chris Leopold, director of Public Health for the county, warned: "The level of untreated disease has actually increased by almost 50 per cent in some patches."

John Hunt, Chief Executive for the British Dental Association, said: "Evidence is emerging of a deterioration in oral health in children in some areas. The problem must be tackled if major advances made in the last 50 years are to be maintained."

The shortage of NHS dentists is so great in Cornwall that when an NHS practice opened in Truro last year, the dentists needed a "bouncer" to control the queues. "There were queues stretching down the road and around the corner," said dentist Neil Corbett. Over three weeks the practice signed up 4,000 people. On some days 70 people an hour were registered. Corbett said many of his patients had not been to a dentist for years, and many had rotten teeth.

"This is typical," he said, holding up a dental X-ray and pointing to dark black patches. "You can see very clearly this patient has some holes and needs four crowns and two root fillings."

A London private dentist estimated that such a course of treatment would cost two thousand pounds. Most dentists say they are willing to continue to treat children on the NHS. But the problem is that once parents are required to pay expensive private fees and stop going, they stop taking their children too, according to Leopold.

The main problem the staff at the St Austell headquarters of the Cornwall dental service have to deal with is finding dentists. At the moment, only eleven of the county's 170 dentists are willing to take on new NHS patients. "Very often we have people calling in pain who need urgent attention. Patients are travelling long distances, in excess of 80 mile round trips, just to see the dentist," said Haidee Lynch one of the helpline's two full-time staff.

Dentists blame the Government too. In October 1990, the then conservative Government reduced the fees payable by the NHS to dentists. There have been no significant increases since.

The check up fee, now five pounds eighty pence, has fallen by fourteen per cent in real terms over the past ten years. Private dentists charge upwards of 30 pounds a visit. John Weld of Truro is one of thousands of dentists who decided to go private after years of treating patients under the NHS. He said that for the fees the NHS pays, he could not give each patient the time needed.

coming events

- **WHAT:** Australasian Academy of Paediatric Dentistry Meeting and ANZSPD Standards of Care.
  WHERE: Adelaide, Australia.
  WHEN: 7-9 May, 1999.
  WHO: Richard Widmer
  Westmead Hospital
  Dental Clinical School
  Westmead NSW 2145.

- **WHAT:** 17th Congress of the International Association of Paediatric Dentistry.
  WHERE: London, UK.
  WHEN: 2-4 September, 1999.
  WHO: Concorde Services Ltd
  10 Wendell Road
  London W12 9RT
  United Kingdom

- **WHAT:** 4th Asian Pacific Cleft Lip and Palate Conference.
  WHERE: Fukuoka, Japan.
  WHEN: 28-30 September, 1999.
  WHAT: Conference Secretariat
  Dr Fumio Ohkubo
  Department of Plastic and Reconstructive Surgery
  School of Medicine
  Showa University
  1-5-8 Hatanodai
  Shinagawa-ku
  Tokyo 142-8666

- **WHAT:** 9th International Congress on Cleft Palate and Related Craniofacial Anomalies.
  WHERE: Göteborg, Sweden.
  WHEN: 24-28 June, 2001.
  WHO: Conference Secretariat
  Congrex Göteborg AB
  Box 5078
  SE 402 22
  GÖTEBORG, Sweden

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